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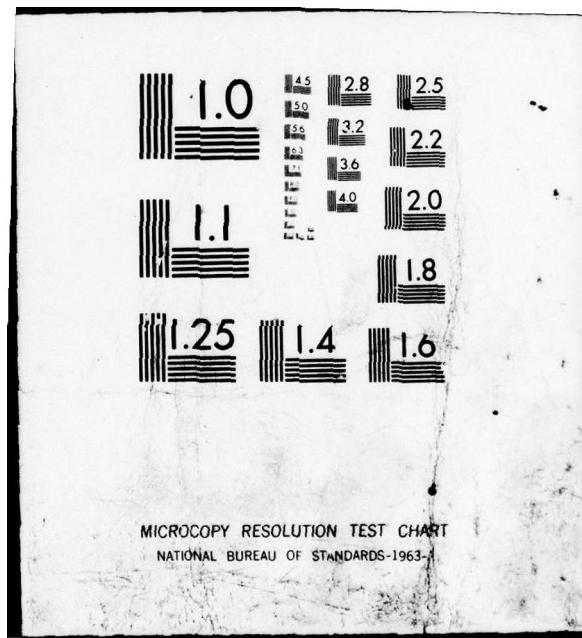
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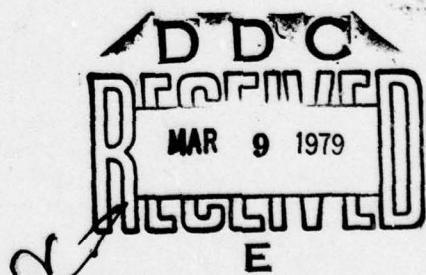


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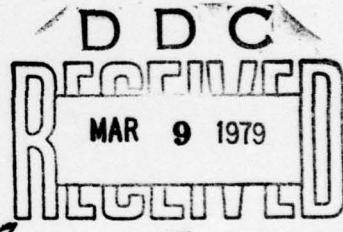
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Staff Paper

WORK UNIT JACK: FINAL REPORT

by  
Robert C. Trexler and Patrick J. Butler



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October 1968

HumRRO Division No. 1 (System Operations)

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| HumRRO Division 1 research personnel were asked to supply technical advisory service to the Southeastern Signal School in preparing and administering a performance test of graduates of a revised course of instruction in switchboard operation. The revised course was designed to provide training for classes containing a broad mix of personnel by AFQT level. Portions of the HumRRO developed test were also administered to graduates of a standard course to compare the courses. | 405-260 <i>SM</i>   |                               |  |  |

## FOREWORD

Work Unit JACK was funded under Task 8d, Modification of Training Courses, Project One Hundred Thousand. The funds made available to HumRRO under task 8d were intended primarily to provide assistance to the U.S. Army Quartermaster School (USAQMS) in revision of the Supplyman Course, MOS 76A10. However, it was also indicated that "As an adjunct to this program, HumRRO would provide technical advisory service to other schools in their revision of similar programs." Under this provision, the U.S. Army Southeastern Signal School (USASESS) requested HumRRO to provide assistance in the revision of the Switchboard Operators Course, MOS 72C20. In April 1967, agreement was reached with USASESS that HumRRO would develop a comprehensive test to evaluate the effectiveness of a revised course for Switchboard Operators prepared by USASESS.

The U.S. Army Research Office requested that the efforts for QMS and SESS be presented in the HumRRO FY 1968 Work Program as Work Units rather than Technical Advisory Service. Accordingly, the QMS effort was designated as Work Unit STOCK; the SESS effort as Work Unit JACK.

The products of Work Unit JACK were provided to SESS on a continuing basis during the conduct of the study thus precluding the need for a formal Consulting Report. The nature of the activities does not warrant preparation of a Technical Report. Issuance of this Staff Paper concludes Work Unit JACK.

J. DANIEL LYONS  
Director of Research  
Division No. 1 (System Operations)

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### The Problem

The Department of Defense and particularly the Department of the Army, in the belief that greater utilization could be made of lower aptitude personnel than was heretofore the case, instituted Project 100,000. CONARC requested HumRRO Division No. 1 to provide Technical Advisory Service in support of two efforts relating to this project. One of these efforts, eventually known as Work Unit STOCK, was addressed to the Quartermaster Supplyman Course. The other effort, which became Work Unit JACK, was addressed to providing Technical Advisory Service to the United States Army Southeastern Signal School in their efforts to adapt the Switchboard Operators Course, MOS 72C20, to receive Category IV personnel under Project 100,000.

In mid-April 1967, initial negotiations were undertaken between personnel of Division 1 and USASESS to explore the level of effort and the role proposed for Division 1 personnel in connection with the school's objectives. At that time the school had already organized a Project 100,000 staff headed by Mr. Leon Helmly as chief of a 5-man task force.

One of the objectives of the USASESS Project 100,000 effort was to revise the then current MOS 72C20 course for more effective training of classes containing students of a broader mental mix. This broader mental mix would result from acceptance as trainees, personnel whose AFQT scores fell within the lower end of Category IV and who previously did not qualify for military service. These personnel were called "new accessions standards" personnel and some were earmarked (special serial number assignment) as Project 100,000 personnel for purposes of control and study. The course revision was a pilot effort to identify and develop the methodology and techniques for revision of other courses also selected to receive classes of a broader mental mix. The course revision included such actions as validation of course objectives, introduction of new teaching aids and techniques, and evaluation of the effectiveness of course improvements.

The specific task assigned HumRRO was that of constructing and administering a performance test to evaluate the effectiveness of the revised 72C20 course in meeting its stated training objectives.

The research staff was eventually responsible for

1. Development of a performance test based on the behavioral objectives prepared by SESS personnel for the revised 72C20 course

2. Managing the conduct of the test including
  - a. Training test administrators
  - b. Scheduling and supervising test administration
3. Designing and conducting the statistical analysis of the test results
4. Preparing a report on the results of the testing program.

#### The Approach

By mid-May the research staff had begun to collect information relating to the technical aspects of the hardware the switchboard operator would be trained to operate and maintain: specifically, the technical manuals relating to the switchboards, the generator, and certain references relating to procedures. The determination of "what to test" and performance standards were based on the detailed course terminal and enabling objectives provided to the research staff by the SESS Project 100,000 staff.

The course objectives forming the basis of the test design were received in late June. By 13 September tests derived from the duty-oriented instructional objectives for the 72C20 course had been prepared. By taking advantage of the redundancy in the terminal objectives for the separate items of equipment it was possible to construct the test that could be conducted in a four day period, although the length of time each trainee was tested was 8 1/2 hours. The equipments utilized in conducting the tests were SB-171, SB-22/PT, AN/TCC-7, SB-86, AN/MTC-1, AN/MTC-3, PU-294, and TA-312.

During the period of 14-17 August selected portions of the test were given a dry run at the Southeastern Signal School. Expert opinion was used to verify test procedures and time limits for other items. In addition, plans were made to pre-test the performance test during the week of 2-6 October. The first two pilot study classes were to be tested during the weeks of 6-10 and 13-17 November. School personnel required to support the administration of the test were: seven instructors, two maintenance men, a supplyman, a senior NCO to serve as NCOIC, and a vehicle driver. Care was taken not to discuss the test with personnel who produced behavioral objectives of the course or who taught the course. By the end of September it was determined that the try-out of the test would be accomplished during the first shift of the week 2-6 October.

Due to certain unexpected constraints upon equipment and test subjects, the scope of the try-out had to be reduced. However, it was

possible to administer each test item at least once. Test item deficiencies were identified and corrected.

Upon the instigation and recommendation of the HumRRO representative, the SESS Director of Instruction approved a plan to gather performance data on graduates of previous 72C20 courses. The HumRRO recommendation was based upon several considerations: (1) the objective of the course revision was to evaluate the effectiveness of course changes, (2) the classes presently attending the standard type of training were of a broad mental mix comparable to those slated for entry into the revised training, and (3) the class (No. 34) next scheduled for graduation was last standard class which could be considered representative of "standard" training. The last three scheduled standard classes (35, 36 and 37) did not receive typical training due to disruption and equipment shortages caused by conversion to the revised training course.

Because of administrative and operational constraints, the testing of Class No. 34 was quite limited in scope. Only the three tests on switchboard operation were administered to the standard course graduates. These tests (#1, #7, and #9) contained 380 test items. The factors influencing this decision were: each test required only 25 to 30 minutes to administer, adequate equipment and space was available and did not create a conflict with the on-going training program; the tests sampled performance of tasks considered to be relatively critical to job success of the field. The three performance tests administered as part of the standard course evaluation program were very similar to the tests selected and sampled the same tasks. And due to this similarity the training of the test administrators on these items could be accomplished in a relatively short time.

During the period 6-18 November and 24 November - 2 December, 40 graduates from pilot study classes 38 and 40 were administered 9 performance tests and 1 written test. The pilot study classes were specifically constituted to contain a broad mental mix of students; e.g., 25% were to be Project 100,000 personnel, 25% were AFQT CAT IV but not Project 100,000 personnel, and the remaining 50% above CAT IV personnel. Pilot study class 38 was administered the performance test during the week of 13-17 November. Only 19 of the 28 students graduating were tested. Among the 9 not tested, 5 were WACs, three were discharged prior to the start of testing and 1 student was AWOL. Graduates of class 39 were not tested because of the limited number (13) of students and the absence of any Category IV personnel. During the period of 27 November to 1 December, 21 graduates of class 40, the 3rd of 4 pilot study classes were tested. Four graduates, all National Guard members were discharged prior to the test.

In summary then, Division 1 research personnel were asked to supply technical advisory service to the Southeastern Signal School in preparing

and administering a performance test of graduates of a revised course of instruction in switchboard operation. The revised course was designed to provide training for classes containing a broad mix of personnel by AFQT level. Portions of the HumRRO developed test were also administered to graduates of a standard course to compare the courses. Administrative problems prevented testing standard training personnel on the entire performance test.

The performance test consisted of 10 tests with a total of 550 items. It was administered to 40 graduates. Selected parts of this test were also administered to 36 graduates of the standard 72C20 course. There was a written test (15 items) on component identification and circuit tracing. The other 9 tests (535 items) constituted the performance test on the equipment. Analysis of the test data and the results reported to the Southeastern Signal School.

The concluding section of this report is entitled "Report of Treatment of Data from the Performance Testing of Classes 38 and 40, Revised Telephone Switchboard Operator Course, 72C20." This section presents the summary statistics which were reported to the Southeastern Signal School in February 1968 in the format largely prescribed by them. Since HumRRO was not asked for comments regarding evaluation or interpretation of the data, none were offered.

#### Discussion

Performance testing has been typically time-consuming and expensive to conduct. The history of the development and the conduct of the testing under JACK is another case supporting that view. The bringing together at one point in time and space of students, test administrators and equipment, while at the same time deflecting competing demands for such personnel and materiel resources is a major managerial activity. Non-training aspects of the soldiers life intrude in the way which complicate the task of scheduling and planning for training operations. That is, medical appointments, guard duty, KP, clean-up details, and sundry administrative personnel actions take precedence over the trainee's day so that the ability to predict numbers of personnel available for certain instructional activities is well nigh impossible much less prediction of the individual by name. The requirement to divert equipment normally used for training to testing imposes a severe demand upon the training system. To minimize the impact of the loss of training equipment for classes still in training while testing was taking place, rescheduling of the testing to non-training periods is a possible answer. But this in itself brings to play other aspects which complicate the lives of the test administrators. In particular, it means that training equipment has to be altered so as to include test problems prior to the commencing of testing and then restored to operational condition prior to the

commencement of training the next day. But problems of this sort are commonplace and form the typical environment in which work of this sort is carried on.

Copies of the test instruments, schedule and test results have been preserved and are retained in the division records. With the publication of this Staff Paper, the task is terminated.

In closing it is interesting to note that in the Southeastern Signal School's report to CONARC on Project 100,000, in early 1968, it was contended that the revised course was effective in meeting its stated training objectives, that groups composed of a broad mental mix were taught effectively, and that the revision of the training resulted in an improvement in training effectiveness for classes of a broad mental mix. Test data based upon the 8 1/2 hour performance test developed by HumRRO under JACK do not support those contentions.

REPORT OF TREATMENT OF DATA FROM THE PERFORMANCE  
TESTING OF CLASSES #38 AND #40, REVISED  
TELEPHONE SWITCHBOARD OPERATOR COURSE (72C20)

Enclosed are the results of the performance testing of personnel trained in the 72C20 Standard (Group #34 Day and Night) and Revised (Group #38 and #40) courses.

There was a total of 575 items in the test. The items were grouped into parts and the parts in turn into tests; 1 written (15 items - 2 parts) and 9 performance on the equipment (70 parts - 560 items). Copies of the Administration and Score Booklets for each test are in Appendix A.

The tests were constructed to elicit the performance behaviors described in Duty-Oriented Behavioral Objectives, prepared by the developers of the revised 72C20 course. The behaviors in a given test or part of a test could be common to more than one Behavioral Objective; e.g., SB-86 switchboard operation was in two Behavioral Objective; switchboard operation of (1) the SB-86, and (2) the MTC-3, (same switchboards - different housing). Appendix B shows the relationship between the test items and the Behavioral Objectives.

Each test or test part had a time limit placed on it. The time limit for the test "behaviors" were never less than that stated in the Behavioral Objectives of the revised course. The man being tested was checked off as performing each item correctly or incorrectly (non-performance was scored "incorrect"). If a man failed to perform all the behaviors in a timed part within the allotted time, he was stopped and received a correct score only for the behaviors he correctly performed.

Personnel trained in the revised course, hereafter referred to as Group #2 personnel, were tested on all items, parts and Behavioral Objectives.<sup>1</sup> Personnel trained in the standard course, hereafter referred to as Group #1, were tested on some parts of most Behavioral Objectives.<sup>2</sup>

The personnel from the standard course who were tested represented a sample from that course. There is no reason to believe that the sample was not representative of the entire group. Those not tested were unavailable because of administrative reasons relating to their next assignment and not related to their class standing or AFQT scores.

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<sup>1</sup>/ Behavioral Objective No. 7, concerned with the commercial switchboard SB-171, was not tested. The two reasons for this were that (1) the SB-171 is very similar to the SB-249 and (2) with the SB-171 equipment available for testing purposes it would not have been administratively possible to test all behaviors.

<sup>2</sup>/ Testing of the standard course personnel was accomplished during the test try out. The availability of standard trained personnel was not sufficient to allow testing on all test items.

Personnel have been grouped into three categories called "III", "IV" and "100K." Those in "III" are personnel in AFQT categories of I, II, and III. Those in "IV" are personnel of AFQT category IV. Those in "100K" are personnel designated as project one hundred thousand; their AFQT scores are predominantly Category IV.

Table 1, Appendix C, shows the mean AFQT scores of Groups #1 and #2.

In the treatment of data, Group #1 (standard) and Group #2 (revised) personnel are compared only on the parts of the test which both groups took. It is not possible to state how well the standard group performed on the Behavioral Objectives because none of the students were tested on all parts.

Tables 2, 3 and 4 in Appendix C contain the results of this comparison.<sup>3</sup>

There were no personnel "washed out" or "washed back" in the revised course. This was not true of the standard course. This would have the effect of inflating the average performance scores of the personnel trained in the standard course by an unknown amount. However, the three lowest scores for Group #2 on all four tests can be dropped to simulate the effect of having "washed out" the "poorer" students. This would be equivalent to an academic attrition rate of approximately 7%.<sup>4</sup> Table 5, Appendix C, provides the results of the comparison when attrition was taken into account for Group #2.

Appendix D contains the results of the analyses designed to provide answers to the question "Did the revised course meet the performance standards for its Behavioral Objectives?"

Tables 1 and 2 report the results of the F and t tests on performance of Group #38 and Group #40 of the revised course.

Table 3 contains a listing of the cut-off scores for each sub-terminal objective within the Duty-Oriented Behavioral Objectives.

Table 4 provides descriptive statistics for evaluating the effectiveness of the revised course in meeting its stated goals.

In Appendix E are the results of the correlations between performance tests scores and selected background variables of personnel from the revised course.

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<sup>3</sup>/ A composite score on all three performance tests was not possible as scores from test #7 were not available on all Group #1 personnel.

<sup>4</sup>/ The average academic attrition rate for the 72C20 course (before revision) was reported to be approximately 3 percent and average class "wash back" between 6-7%.

## APPENDIX A

### TABLE OF CONTENTS

| TEST # | TITLE   |
|--------|---|
| 1      | SB-249 Operation                                      |
| 2      | MTC-1   |
| 3      | SB-22 Installation and Maintenance                    |
| 4      | SB-249 Maintenance                                    |
| 5      | AN/TTC-7 Component Identification and Circuit Tracing |
| 6      | SB-86 Installation and Maintenance                    |
| 7      | SB-22 Operation                                       |
| 8      | MTC-3   |
| 9      | SB-86 Operation                                       |
| 10     | PU-294 Operation and Maintenance                      |

APPENDIX B

ASSIGNMENT OF TEST ITEMS TO THE BEHAVIORAL OBJECTIVES

| TERMINAL OBJECTIVE | TEST   |
|--------------------|--|
| 1-a                | 3-1-1 thru 3-1-3;<br>3-2-1 thru 3-2-2  |
| 1-b                | 3-3-1 thru 3-3-6;<br>3-4-1 thru 3-4-6;<br>3-8-1 thru 3-8-7                   |
| 1-c                | All of Test #7   |
| 1-d                | 3-5.1 thru 3-5.4   |
| 1-e                | 5-6-1 thru 5-6-12;<br>5-7-1 thru 5-7-8                                       |
| 2-a                | 6-1-1 thru 6-1-4;<br>6-1-7 & 6-1-8;<br>6-3-4 thru 6-3-13                     |
| 2-b                | 6-1-5 & 6-1-6;<br>6-6-1 thru 6-6-7;<br>6-4-1 thru 6-4-6;<br>6-3-1 thru 6-3-3 |
| 2-c                | All of Test #9   |
| 2-d                | 6-5.1 thru 6-5.6   |
| 2-e                | 6-3-14 thru 6-3-19   |
| 3-a                | 5-A-1 thru 5-A-9   |
| 3-b                | 5-B-1 thru 5-B-6   |

| TERMINAL OBJECTIVE | TEST   |
|--------------------|--|
| 3-c                | All of Test #1   |
| 3-d                | 4-1 thru 4-9<br>(All of Test)  |
| 4-a                | 8-1-1 thru 8-1-3;<br>8-2-1 thru 8-2-7;<br>8-3-1 thru 8-3-4;<br>8-4-1 thru 8-4-2;<br>8-5-1 thru 8-5-8 |
| 4-b                | All of Test #9   |
| 4-c                | 6-5.1 thru 6-5.6   |
| 4-d                | 8-6-1 thru 8-6-4;<br>8-7-1;<br>6-3-4 thru 6-3-19;<br>3-7-1 thru 3-7-8                                |
| 5-a                | 2-1-1 thru 2-1-7; 2-2;<br>2-3-1 & 2-3-2  |
| 5-b                | All of Test #1   |
| 5-c                | 2-4-1 thru 2-4-4;<br>4-1 thru 4-9  |
| 6-a                | All of Test #1   |
| 6-b                | 4-1 thru 4-9   |
| 8-a                | 10-1-1 thru 10-1-4   |
| 8-b                | 10-3-1 thru 10-3-10  |
| 8-c                | 10-2-1 thru 10-2-13  |

APPENDIX C

TABLE 1

MEAN AFQT SCORES

| GROUP<br># | APTITUDE CATEGORIES |       |       |       |
|------------|---------------------|-------|-------|-------|
|            | III                 | IV    | 100K  | TOTAL |
| 1          | 49.46               | 18.19 | 15.14 | 28.89 |
| 2          | 52.69               | 21.00 | 13.25 | 28.97 |

\* Missing AFQT scores were reconstructed by converting selected ACB scores.

## APPENDIX C

TABLE 2 - TREATMENT OF TEST #5 DATA

### ANALYSIS OF VARIANCE

| A- REVISED<br>TRAINING<br>CLASSES | B- APTITUDE CATEGORIES                    |  |  |
|-----------------------------------|---|--|--|
|                                   | III                                       | IV                                       | 100K                                     |
| CLASS #38                         | N= 4<br><br>MEAN= 3.25<br><br>S.D.= 1.89  | N= 9<br><br>MEAN= 2.89<br><br>S.D.= 1.45 | N= 6<br><br>MEAN= 2.50<br><br>S.D.= 0.55 |
| CLASS #40                         | N= 10<br><br>MEAN= 3.20<br><br>S.D.= 2.20 | N= 5<br><br>MEAN= 4.00<br><br>S.D.= 3.46 | N= 6<br><br>MEAN= 1.17<br><br>S.D.= 0.75 |

### F Probability

|                        |       |
|------------------------|-------|
| A- TRAINING CLASSES    | 0.887 |
| B- APTITUDE CATEGORIES | 0.094 |
| AB- INTERACTION        | 0.302 |

BARLETT'S TEST = 17.408

PROBABILITY OF CHI SQUARE = 5 df, 0.0042

## APPENDIX C

TABLE 3 - TREATMENT OF TEST #7 DATA

## ANALYSIS OF VARIANCE

| A- TYPE OF TRAINING | B- APTITUDE CATEGORIES                  |                                       |                                       |
|---------------------|---|---------------------------------------|---------------------------------------|
|                     | III                                     | IV                                    | 100K                                  |
| GROUP #1            | N = 12<br>MEAN = 102.17<br>S.D. = 12.57 | N = 8<br>MEAN = 100.12<br>S.D. = 9.08 | N = 5<br>MEAN = 94.00<br>S.D. = 13.77 |
| GROUP #2            | N = 14<br>MEAN = 99.36<br>S.D. = 9.37   | N = 14<br>MEAN = 95.79<br>S.D. = 9.23 | N = 12<br>MEAN = 86.25<br>S.D. = 7.03 |

F Probability

A- TYPE OF TRAINING                    0.066  
 B- APTITUDE CATEGORIES                0.005  
 AB- INTERACTION                        0.740

BARLETT'S TEST = 4.714PROBABILITY OF CHI SQUARE = 5 df, 0.4519

## t TESTS

| COMPARISON GROUPS                         | t value | df | Level of Significance |
|---|---------|----|-----------------------|
| All of Group #1, vs all of Group #2       | 2.010   | 63 | 0.05                  |
| 100K, Group #1 vs. 100K, Group #2         | 1.196   | 15 | NS                    |
| III & IV, Group #1 vs. III & IV, Group #2 | 1.243   | 46 | NS                    |
| IV, Group #1 vs. IV, Group #2             | 1.072   | 20 | NS                    |
| III, Group #1 vs. III, Group #2           | 0.637   | 24 | NS                    |
| IV, Group #1 vs. 100K, Group #1           | 0.882   | 11 | NS                    |
| III, Group #1 vs. 100K, Group #1          | 1.143   | 15 | NS                    |
| III, Group #1 vs. IV, Group #1            | 0.421   | 18 | NS                    |
| IV, Group #2 vs. 100K, Group #2           | 2.984   | 24 | 0.01                  |
| III, Group #2 vs. 100K, Group #2          | 4.066   | 24 | 0.001                 |
| III, Group #2 vs. IV, Group #2            | 1.016   | 26 | NS                    |

## APPENDIX C

TABLE 4 - TREATMENT OF TEST #1 & #9 DATA

### ANALYSIS OF VARIANCE

| A- TYPE OF TRAINING | B- APTITUDE CATEGORIES                  |   |   |
|---------------------|---|---|---|
|                     | III                                     | IV                                      | 100K                                    |
| GROUP #1            | N = 14<br>MEAN = 213.93<br>S.D. = 14.05 | N = 15<br>MEAN = 201.93<br>S.D. = 17.40 | N = 7<br>MEAN = 202.00<br>S.D. = 24.70  |
| GROUP #2            | N = 14<br>MEAN = 202.50<br>S.D. = 15.86 | N = 14<br>MEAN = 200.07<br>S.D. = 9.18  | N = 12<br>MEAN = 187.00<br>S.D. = 16.26 |

### F Probability

|   |       |
|---|-------|
| A- TYPE OF TRAINING                                 | 0.015 |
| B- APTITUDE CATEGORIES                              | 0.016 |
| AB- INTERACTION                                     | 0.346 |
| <br>BARLETT'S TEST = <u>9.104</u>                   |       |
| <br>PROBABILITY OF CHI SQUARE = <u>5 df, 0.1051</u> |       |

### t TESTS

| COMPARISON GROUPS                         | t value | df | Level of Significance |
|---|---------|----|-----------------------|
| All of Group #1, vs. all of Group #2      | 2.476   | 74 | 0.02                  |
| 100K, Group #1 vs. 100K, Group #2         | 1.435   | 17 | NS                    |
| III & IV, Group #1 vs. III & IV, Group #2 | 1.636   | 55 | NS                    |
| IV, Group #1 vs. IV, Group #2             | 0.364   | 27 | NS                    |
| III, Group #1 vs. III, Group #2           | 2.018   | 26 | NS                    |
| IV, Group #1 vs. 100K, Group #1           | -0.006  | 20 | NS                    |
| III, Group #1 vs. 100K, Group #1          | 1.185   | 19 | NS                    |
| III, Group #1 vs. IV, Group #1            | 2.049   | 27 | NS                    |
| IV, Group #2 vs. 100K, Group #2           | 2.468   | 24 | 0.05                  |
| III, Group #2 vs. 100K, Group #2          | 2.451   | 24 | 0.05                  |
| III, Group #2 vs. IV, Group #2            | 0.496   | 26 | NS                    |

## APPENDIX C

TABLE 5 - COMPARISON OF GROUP #1 WITH GROUP #2 PERSONNEL AFTER AN  
ADJUSTMENT FOR ACADEMIC ATTRITION IN GROUP #2 HAS BEEN  
MADE

### t TEST

| PERFORMANCE MEASURES    | t value | df | Level of Significance |
|-------------------------|---------|----|-----------------------|
| Test #1 and #9 combined | 1.929   | 71 | NS                    |
| Test #5                 | 4.725   | 49 | .001                  |
| Test #7                 | 1.729   | 60 | NS                    |

## APPENDIX D

TABLE 1 - TREATMENT OF TEST #5 DATA

## ANALYSIS OF VARIANCE

| A- TYPE OF TRAINING | B- APTITUDE CATEGORIES               |                                      |                                      |
|---------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|                     | III                                  | IV                                   | 100K                                 |
| GROUP #1            | N = 4<br>MEAN = 7.00<br>S.D. = 2.16  | N = 6<br>MEAN = 7.17<br>S.D. = 2.04  | N = 4<br>MEAN = 3.50<br>S.D. = 1.29  |
| GROUP #2            | N = 14<br>MEAN = 3.21<br>S.D. = 2.04 | N = 14<br>MEAN = 3.29<br>S.D. = 2.30 | N = 12<br>MEAN = 1.83<br>S.D. = 0.94 |

F ProbabilityA- TYPE OF TRAINING 0.000B- APTITUDE CATEGORIES 0.001AB- INTERACTION 0.242BARLETT'S TEST = 8.691PROBABILITY OF CHI SQUARE = 5 df, 0.1224

## t TESTS

| COMPARISON GROUPS                         | t value | df | Level of Significance |
|---|---------|----|-----------------------|
| All of Group #1, vs. all of Group #2      | 4.508   | 52 | 0.001                 |
| 100K, Group #1 vs. 100K, Group #2         | 2.381   | 14 | 0.05                  |
| III & IV, Group #1 vs. III & IV, Group #2 | 5.188   | 36 | 0.001                 |
| IV, Group #1 vs. IV, Group #2             | 3.747   | 18 | 0.01                  |
| III, Group #1 vs. III, Group #2           | 3.127   | 16 | 0.01                  |
| IV, Group #1 vs. 100K, Group #1           | 3.479   | 8  | 0.02                  |
| III, Group #1 vs. 100K, Group #1          | 2.782   | 6  | 0.05                  |
| III, Group #1 vs. IV, Group #1            | -0.122  | 8  | NS                    |
| IV, Group #2 vs. 100K, Group #2           | 2.161   | 24 | 0.05                  |
| III, Group #2 vs. 100K, Group #2          | 2.264   | 24 | 0.05                  |
| III, Group #2 vs. IV, Group #2            | -0.087  | 26 | NS                    |

## APPENDIX D

TABLE 2 - TREATMENT OF TESTS #1-10, EXCLUDING #5 DATA

### ANALYSIS OF VARIANCE

| REVISED<br>TRAINING<br>CLASSES | APTITUDE CATEGORIES                     |  |  |
|--------------------------------|---|--|--|
|                                | III                                     | IV                                     | 100K                                   |
| CLASS #38                      | N = 4<br>MEAN = 425.00<br>S.D. = 28.69  | N = 9<br>MEAN = 408.44<br>S.D. = 21.29 | N = 6<br>MEAN = 382.17<br>S.D. = 38.52 |
| CLASS #40                      | N = 10<br>MEAN = 417.70<br>S.D. = 35.47 | N = 5<br>MEAN = 406.80<br>S.D. = 42.17 | N = 6<br>MEAN = 364.17<br>S.D. = 17.22 |

### F Probability

TRAINING CLASSES                    0.396

APTITUDE CATEGORIES                0.002

INTERACTION                        0.809

BARLETT'S TEST = 5.632

PROBABILITY OF CHI SQUARE = 5 df, 0.3441

### t TESTS

| COMPARISON GROUPS                         | t value | df | Level of Significance |
|---|---------|----|-----------------------|
| All of Group #1, vs. all of Group #2      |         |    |                       |
| 100K, Group #1 vs. 100K, Group #2         |         |    |                       |
| III & IV, Group #1 vs. III & IV, Group #2 |         |    |                       |
| IV, Group #1 vs. IV, Group #2             |         |    |                       |
| III, Group #1 vs. III, Group #2           |         |    |                       |
| IV, Group #1 vs. 100K, Group #1           |         |    |                       |
| III, Group #1 vs. 100K, Group #1          |         |    |                       |
| III, Group #1 vs. IV, Group #1            |         |    |                       |
| IV vs. 100K                               | 2.998   | 24 | 0.01                  |
| III vs. 100K                              | 3.788   | 24 | 0.001                 |
| III vs. IV                                | 1.024   | 26 | NS                    |

## APPENDIX D

TABLE 3 - CUT-OFF SCORES FOR TERMINAL OBJECTIVES

| OBJECTIVE |   | NUMBER OF TEST ITEMS | ACCURACY STANDARD | CUT-OFF SCORE ** |
|-----------|---|----------------------|-------------------|------------------|
| #1        | a | 5                    | 80%               | 4                |
|           | b | 19                   | 80%*              | 15               |
|           | c | 129                  | 90%               | 116              |
|           | d | 4                    | 80%*              | 3                |
|           | e | 20                   | 80%*              | 16               |
| #2        | a | 16                   | 80%               | 13               |
|           | b | 18                   | 80%*              | 14               |
|           | c | 126                  | 90%               | 113              |
|           | d | 6                    | 80%*              | 5                |
|           | e | 6                    | 80%*              | 5                |
| #3        | a | 9                    | 7 of 9            | 7                |
|           | b | 6                    | 4 of 6            | 4                |
|           | c | 125                  | 90%               | 112              |
|           | d | 9                    | 80%*              | 7                |
| #4        | a | 24                   | 90%               | 22               |
|           | b | 126                  | 90%               | 113              |
|           | c | 6                    | 80%*              | 5                |
|           | d | 29                   | 80%*              | 23               |
| #5        | a | 10                   | 90%               | 9                |
|           | b | 125                  | 90%               | 112              |
|           | c | 13                   | 80%*              | 10               |
| #6        | a | 125                  | 90%               | 112              |
|           | b | 9                    | 80%*              | 7                |
| #8        | a | 4                    | 90%               | 3***             |
|           | b | 10                   | 90%               | 9                |
|           | c | 13                   | 80%*              | 10               |

NOTES

\* Accuracy standards were not specified in the "Duty-Oriented Instructional Objectives" and were arbitrarily set at 80% by the Research staff.

\*\* Cut-off scores were rounded off to nearest whole number.

\*\*\* Actually represents accuracy standard of 75%.

PERCENT OF REVISED COURSE PERSONNEL MEETING BEHAVIORAL OBJECTIVE  
PERFORMANCE STANDARDS

| TERMINAL<br>OBJECTIVE | CUT-OFF<br>SCORE | PERCENT MEETING CUT-OFF SCORE |            |              |             | MEAN SCORE OF<br>ALL CATEGORIES |
|-----------------------|------------------|-------------------------------|------------|--------------|-------------|---------------------------------|
|                       |                  | III<br>N=14                   | IV<br>N=14 | 100K<br>N=12 | ALL<br>N=40 |                                 |
| 1a                    | 4                | 21.43                         | 21.43      | 16.67        | 20.00       | 2.92                            |
| 1b                    | 15               | 50.00                         | 35.71      | 16.67        | 35.00       | 13.17                           |
| 1c                    | 116              | 7.14                          | 7.14       | 0.0          | 5.00        | 94.17                           |
| 1d                    | 3                | 7.14                          | 21.43      | 8.33         | 12.50       | 0.95                            |
| 1e                    | 16               | 7.14                          | 7.14       | 0.0          | 5.00        | 11.30                           |
| TOTAL<br>OBJECTIVE    | 154              | 0.0                           | 7.14       | 0.0          | 2.50        | 122.52                          |
| 2a                    | 13               | 35.71                         | 28.57      | 8.33         | 25.00       | 10.05                           |
| 2b                    | 14               | 50.00                         | 35.71      | 16.67        | 35.00       | 12.32                           |
| 2c                    | 113              | 21.43                         | 0.0        | 0.0          | 7.50        | 102.63                          |
| 2d                    | 5                | 14.29                         | 0.0        | 0.0          | 5.00        | 2.30                            |
| 2e                    | 5                | 0.0                           | 0.0        | 0.0          | 0.0         | 1.65                            |
| TOTAL<br>OBJECTIVE    | 150              | 7.14                          | 0.0        | 0.0          | 2.50        | 128.95                          |
| 3a                    | 7                | 0.0                           | 0.0        | 0.0          | 0.0         | 2.70                            |
| 3b                    | 4                | 0.0                           | 7.14       | 0.0          | 2.50        | 0.63                            |
| 3c                    | 112              | 7.14                          | 7.14       | 0.0          | 5.00        | 94.37                           |
| 3d                    | 7                | 7.14                          | 35.71      | 16.67        | 20.00       | 4.65                            |
| TOTAL<br>OBJECTIVE    | 130              | 0.0                           | 0.0        | 0.0          | 0.0         | 102.35                          |
| 4a                    | 22               | 7.14                          | 0.0        | 0.0          | 2.50        | 15.77                           |
| 4b                    | 113              | 21.43                         | 0.0        | 0.0          | 7.50        | 102.63                          |
| 4c                    | 5                | 14.29                         | 7.14       | 0.0          | 7.50        | 2.27                            |
| 4d                    | 23               | 0.0                           | 0.0        | 0.0          | 0.0         | 14.32                           |
| TOTAL<br>OBJECTIVE    | 163              | 0.0                           | 0.0        | 0.0          | 0.0         | 135.00                          |

| TERMINAL<br>OBJECTIVE   | CUT-OFF<br>SCORE | PERCENT MEETING CUT-OFF SCORE |       |       |       | MEAN SCORE OF<br>ALL CATEGORIES |
|---|------------------|-------------------------------|-------|-------|-------|---------------------------------|
|   |                  | III                           | IV    | 100K  | ALL   |                                 |
| 5a  | 9                | 0.0                           | 0.0   | 0.0   | 0.0   | 3.95                            |
| 5b  | 112              | 7.14                          | 7.14  | 0.0   | 5.00  | 94.37                           |
| 5c  | 10               | 7.14                          | 35.71 | 8.33  | 17.50 | 7.42                            |
| TOTAL<br>OBJECTIVE  | 131              | 0.0                           | 0.0   | 0.0   | 0.0   | 105.75                          |
| 6a  | 112              | 7.14                          | 7.14  | 0.0   | 5.00  | 94.37                           |
| 6b  | 7                | 7.14                          | 35.71 | 16.67 | 20.00 | 4.65                            |
| TOTAL<br>OBJECTIVE  | 119              | 7.14                          | 0.0   | 0.0   | 2.50  | 99.02                           |
| 8a  | 3                | 78.57                         | 71.43 | 58.33 | 70.00 | 2.82                            |
| 8b  | 9                | 21.43                         | 14.29 | 8.33  | 15.00 | 5.60                            |
| 8c  | 10               | 64.29                         | 35.71 | 58.33 | 52.50 | 9.52                            |
| TOTAL<br>OBJECTIVE  | 22               | 35.71                         | 28.57 | 16.67 | 27.50 | 17.95                           |
| AVERAGE<br>PERCENT<br>ABOVE CUT-<br>OFF ACROSS<br>ALL TOTAL<br>OBJECTIVES | 869              | 7.14                          | 5.10  | 2.38  | 5.00  | 711.55                          |

## APPENDIX E

### CORRELATIONS BETWEEN TOTAL TEST PERFORMANCE AND SELECTED BACKGROUND VARIABLES OF REVISED COURSE PERSONNEL (N=40)

| VARIABLE          | CORRELATION VALUE | LEVEL OF SIGNIFICANCE | MEAN SCORE |
|-------------------|-------------------|-----------------------|------------|
| VE                | 0.37              | 0.02                  | 92.8       |
| EL                | 0.46              | 0.01                  | 87.55      |
| CL                | 0.46              | 0.01                  | 99.35      |
| GT                | 0.55              | 0.01                  | 88.37      |
| ED                | 0.23              | NS                    | 11.57      |
| AFQT              | 0.48              | 0.01                  | 28.97      |
| TOTAL PERFORMANCE | —                 | —                     | 401.62     |

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